

Common Core State Standards: Rigor



CCIU: DEPARTMENT OF TEACHING AND LEARNING



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Rigorous Curriculum

School leaders across the county are interested in the rigor or academic challenge of instruction and assessment in the classroom. Yet rigor poses a challenge in itself as being difficult to define and measure. For example, what would educators need to do to increase rigor in their curriculum to improve student achievement? Would high-stake tests provide help in determining the rigor experienced by students?



Rigor

Educators are correct in looking to rigor to improve learning and performance on testing. Results of high-stakes tests provide little help in understanding current levels of rigor experienced by students. What often occurs, though, is the unintended consequence of increasing failure when rigor is misconstrued as simply being harder content, increased homework, or increased rate of instruction.

PONDER/ACTIVITY

- 1. Complete Activity: Myths Regarding Regard, **Chapter 2 section 1**.
- 2. Define “cognitive rigor” as it relates to instruction, learning and/or assessment.
- 3. Define “relevance” as it relates to instruction, learning and/or assessment..

Optional: On a sheet of paper define cognitive rigor and relevance and then share your definitions with the group.

Relevance

Relevance is defined by one using their knowledge to tackle real-world problems with more than one solution. Real-world problems connect culture with learning and allows curriculum development that is deeply grounded in particular places and highly democratic in its process to solve. The challenge is that what is relevant to one student might not be relevant to the next student, which is why the teacher’s expertise and knowledge regarding their student is critical for differentiating classroom material to meeting the needs of all their students.

Establishing relevant material is critical for individual motivation. Student motivation is the desire to participate in an activity. Students who are given a task that is relevant will work longer, harder, and with more vigor and intensity when they are motivated. Teachers guiding individual student learning to insure content relevance will help in motivating students to learn.

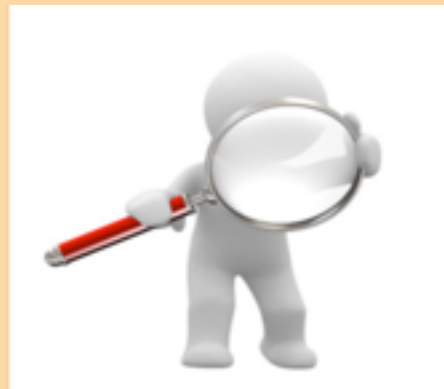
What is Rigor?

Although the terminology varies from definition to definition, there is a universal thread that rigorous learning should be focused on all students being able to deeply understand complex ideas so they can solve problems and transfer their knowledge to new situations. Support structures and collaborative work are essential components to guide students’ success. Increasing rigor is about increasing the complexity of thinking with more challenging cognitive processes such as applying, analyzing, evaluating, and creating. According to Danielson

(2009), tasks by themselves are not rigorous. What makes a task rigorous is the gap between the demand of the task and the cognitive capabilities of a student who needs to complete the task. The difference between what rigor is, and is not, coming from the order of thought. Is a lesson rigorous because it is difficult, or might it be difficult because it is rigorous?

Rigor in a classroom does not equate out to work energy students required by students. Rigor is referenced as the cognitive energy involved in a student's capacity to work with complex, challenging, and ambiguous content for acquiring new information that can be transferred and applied to new situations or used to create new ideas. Rigor in the classroom is a hotly debated topic amongst educators. Rigorous instruction requires student to construct meaning for themselves, impose structure on information, integrate individual skills into proc-

Video 1:1: Rigor



Hessel, B. (2010). Rigor. Retrieved from <http://youtu.be/Aot1SNflbTE>. Video for demonstrating different rigorous instructional practices in the classroom.

esses, and apply what they learn in more than one context and to unpredictable situations.

According to Blackburn (2008), (<http://goo.gl/nSuc7>) true rigor is creating an environment in which each student is expected to learn at high levels, each student is supported so he or she can learn at high levels, and each student demonstrates learning at high levels. According to Strong, Silver, and Perini (2001), “Rigor is the goal of helping students develop the capacity to understand content that is complex, ambiguous, provocative, and personally or emotionally challenging.” Students learn to manage difficult content and work with difficult ideas. Students are presented with content created from interconnected parts or that include of multiple meanings. Lessons might include sorting through a dilemma or struggling with an emotionally challenging problem. Lessons are concerned with the quality, or depth, of the content more than the quantity, or breadth. Rigor is more than what is taught and what standards are covered; it is about the teaching and how students how they understand. Rigor means that all students are challenged to understand and work with difficult concepts and can make their own discoveries and expand their understanding about how the world works. Thus, by creating student content that is rigorous and relevant will empower students to learn.

Curriculum Design for Rigor and Relevance

Standards refers to the desired *qualities* of student work and the degree of *rigor* that must be assessed and achieved. The

cognitive energy involved requires students thinking for the purpose to comprehend content before they can applying for it to new situations or creating new ideas.

As educators, we need to refer to “high standards” the same way it is applied in athletics, music, or business by viewing quality of outcomes, not the inputs. Educators need to ask if students’ work meets standards, not whether the standard are covered. Standards are a set of criteria for building and testing local assessment. They tell educators where and what we must look for in students’ work to determine if it meets standards. This information is critical to guide local assessments and ensures that these are validly anchored against the state standards.

A performance-based understanding of Standards is at the heart of the Common Core and build in a a rigorous curriculum and assessment system. To accomplish this, the curriculum and related instruction must be designed backward from an analysis of standards-based assessment. For example, curriculum where a student performance task is anchored by rigorous rubrics and annotated work samples. Through backward design the curriculum is designed from tasks, reflecting the performance that the Common Core Standards requires.

The Common Core State Standards (CCSS) are a set of criteria to be taught within the context of a “content-rich curriculum.” The CCSS does not specify what content students need to master. The responsibility for developing the curriculum falls to schools and districts. Schools need to design a coherent se-

quence of thematic curriculum units. The units need to connect the skills outlined in the CCSS for literature, math, and informational texts. The activities provide scaffold instruction so students receive comprehensible input and are able to successfully complete tasks. Scaffolding requires educators to know the students and make instruction meaningful and provide well-known materials so they are not struggling while trying to learn new skills. The tasks within the unit have clearly defined and measurable activities that contribute to the accomplishment of the standard. Each activity and assessment should have CCSS citation to ensure alignment. A completed school curriculum map needs to ensure that every standard in the CCSS is addressed, some standards might be covered more than once.

The creation of the units and tasks require the expertise and knowledge of the teachers who know specifically the needs of each student. In creating the units and tasks, teachers need to work efficiently and effectively using the tools and information available in a global society.

To work efficiently and effectively means using online resources and tools, that allow for sharing and dissemination of information. Today’s teacher’s voices need to be heard beyond their classroom walls. Teachers need to know the needs of their students based on their culture, ability, interests, and learning styles. When we teach, we do not just teach the content, we teach students the content. Based on students’ needs teachers need to use the tools and resources available in to-

days society to collaborate, online or in person, and create the content that meets the goals set by the CCSS.

In a digital world *information* is defined as flows of data delivered to people. Bohn and Short (2010), measured the bytes, words, and hours of consumer information to quantify Americans consumed information.

Americans consumed information for about 1.3 trillion hours, an average of almost 12 hours per day. Consumption totaled 3.6 zettabytes and 10,845 trillion words, corresponding to 100,500 words and 34 gigabytes for an average person on an average day. A zettabyte is 10 to the 21st power bytes, a million million gigabytes (Bohn & Short, 2010). (<http://goo.gl/IR7Xq>)

The depth and breadth of information available by the internet is enormous. Teachers are not expected to be experts of everything; they do need to know how to use today's digital tools to access information for the purpose of knowledge creation and transfer for making decisions. Today's students are being impacted by the amount and how they access information. That is resulting in broader and deeper learning for students, when accessing topics that interest them (Purcell, Rainie, Heaps, Buchanan, Friedrich, Jacklin, Chen, and Zichuhr, 2012).

ARTICLE

Purcell, Rainie, Heaps, Buchanan, Friedrich, Jacklin, Chen, and Zichuhr (2012), *How Teens Do Research in the Digital World*.

<http://pewinternet.org/Reports/2012/Student-Research>

As teachers create their units they need to know how to use the digital tool to engage the students in active learning processes to construct new understandings of the world around them. Active learning means exploration, experimentation, discussion, and reflection.

The type of resources available in a digital society for sharing and creating content are vast. To be successful and meet the demands teachers need to be able to find and share standards-based resources in a peer reviewed searchable repository, for example Open Educational Resources (OER) Commons (<http://www.oercommons.org/about>) .

OER provides educators the means to be more efficient, save educators time, reduce costs, increase quality, and enhance the variety of resources available. Sharing empowers teachers and OER provides the means. The type of resources available within the repository can range from a single URL, to a web page, a unit, a task, a lesson, etext book, streaming videos, rubrics, and more. OER provides the framework to enable peers to collaborate and sharing nationally, enhancing the diversity of thinking and understanding resulting in improved learning for all.

The traditional textbook may still be used as a resource for help in supporting areas where students present insufficient background knowledge to connection with topics. Remember, the textbook is not the curriculum nor does it know your students. That is not to say that there aren't some exemplary textbooks out there, but it is important to remember that textbooks were never intended to replace teachers' expertise, knowledge, or intuition in the classroom. Don't forget in a time of tight school budgets all textbook publishers are for-profit business, and create a one-size-fits all product, but their bottom line is sales.

Video &Activity: Identifying Rigor



Video presented by NYC DOE Promising Practice regarding Depth of Knowledge.

Link: <http://vimeo.com/42788913#>

PONDER

1. How are your units designed in your classroom?
2. What resources do you use in creating your units?
3. What digital tools are being used?
4. What type of learning goes on daily in your classroom? (Active or Passive)

Determining Cognitive Rigor

Regardless of the grade level or discipline being taught, the CCSS calls for more rigorous learning units. More rigorous curriculum or lessons are for all students; rigor is not limited to gifted or college bound programs. To ensure that everyone understands "rigor," or cognitive demand, in assessments as well as curricular units, lessons, and tasks, Webb's Depth of Knowledge (DOK) will be used. DOK provides the vocabulary and a frame of reference when thinking about student engagement with the content. DOK will be the lens that educators will use for creating and evaluating tasks.

The video below introduces the Depth of Knowledge a tool to increase instructional rigor, and applies the tool through succession of a social studies task from DOK Level 1 to a DOK level 4.

Where We Have Been And Where We Are Going

Completed section one: Rigor

- In conjunction with the release of the new common core state standards, and the development of assessments over the next 3-7 years, states assessment will be more rigorous and contain more real-world content. Future assessment will include performance-based task, such as conducting experiment requiring deeper levels of learning and thinking than the typical multiple-choice questions. Rigors curriculum is needed to prepare tomorrow students ready for college and career.

Next, section two: Bloom's Taxonomy

- Bloom's Taxonomy is a big piece of the CCSS. Since all students need to meet the CCSS, this will require teachers to differentiate assignments for students needs. All students will be working on the same standard, but they could be completing different assignments to demonstrate their work in that standard. Using Bloom's Taxonomy, different verbs represent levels of cognitive process.

Section three: Webb's Depth -of-Knowledge,

- The CCSS, grounded in Norman Webb's depth of knowledge is used to define the requirement to demonstrate proficiency in addressing a standard. Unlike Bloom's system, Depth-of-Knowledge levels are determined by the degree of mental processing required by the student to meet the objectives of particular activity.

Section four: Hess' Cognitive Rigor Matrix.

Hess' Cognitive Matrix applies Webb's Depth of Knowledge Levels to Bloom's Cognitive Process Dimensions. The three section cover the background knowledge and factors that go

into determining rigor, complexity, and critical thinking for assessment of the CCSS.

Benjamin Bloom

In 1956, a committee of colleges led by Benjamin Bloom identified three overlapping domains of educational activity called cognitive, affective, and psychomotor (Anderson & Krathwohl, 2001). The committee divided the domains into subdivisions, starting from the simplest levels of intellectual behavior important in learning to the most complex. See figure 2.1, Bloom’s three domains.

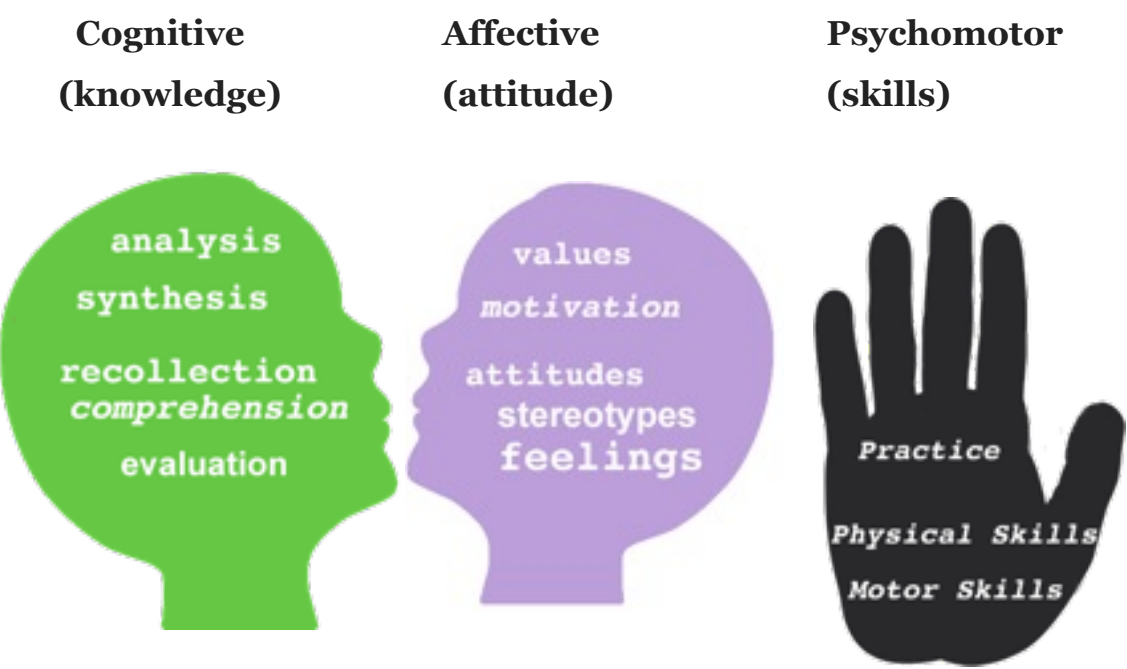


Figure 2.1: Bloom’s domains of educational activity.

The committee divided the domains into subdivisions, starting with the simplest levels of intellectual behavior important in learning to the most complex. Table 2.1 presents the subdivision of the three domains.

COGNITIVE	AFFECTIVE	PSYCHOMOTOR
<i>Knowledge</i>	<i>Attitude</i>	<i>Skills</i>
Knowledge (recall data)	Receive (awareness)	Initiation (copy)
Comprehension (understand)	Respond (react)	Manipulation (follow instructions)
Application (apply, use)	Value (understand/act)	Develop precision
Analysis (structure/elements)	Organize personal value system	Articulation (combine, integrate related skills)
Synthesize (create/build)	Internalize value system (adopt behavior)	Naturalization (automate, become expert)
Evaluate (assess, judge in relational terms)		

Table 2.1: Blooms three domains and subdivisions

The taxonomy was created for categorizing the levels of abstraction of questions that commonly occur in educational settings. Bloom’s research found that 95% of the test questions

students encounter at the college level required them to think only at the knowledge level, the simplest level of the subdivision of the cognitive domain typically requiring students to only recall information.

The cognitive domain level consist of six level containing knowledge, comprehension, application, analysis, synthesis, and evaluation. See figure (2.2), the triangle present the six subdivision of the cognitive domain. The levels starting with the simplest intellectual behavior recall of facts, *knowledge*, to the highest order of thinking, *evaluation*.

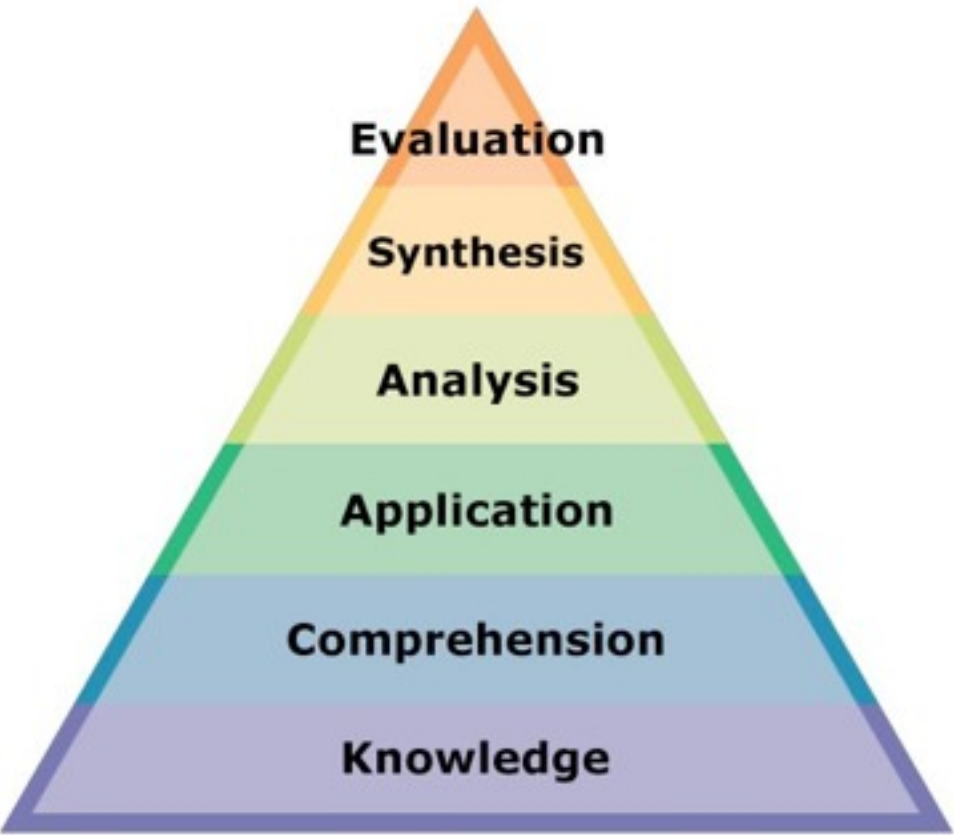


Figure 2.2: Bloom’s cognitive domain and six subdivisions starting with the simplest intellectual behavior.

To apply Bloom’s Taxonomy levels to learning objectives, each specific learning behavior was defined along with descriptive verbs, to be used for writing instructional outcomes. See Table 2.2, on page 10.

Educators found such verb cues of Bloom’s Taxonomy levels to be useful in guiding teacher questioning, but too often verbs appeared at more than one level in the taxonomy. This resulted in the verb alone being inadequate for determining the actual cognitive demand required to understand the content addressed in the learning or test question.

ACTIVITY: BLOOMS TAXONOMY TABLE

1. Table 2.2, highlight the verbs that appear in more than one subdivision.

KNOWLEDGE	COMPREHENSION	APPLICATION	ANALYSIS	SYNTHESIS	EVALUATION
Remember previously learned information.	Demonstrate an understanding of the facts.	Apply knowledge to actual situations.	Break down objects or ideas into simpler parts and find evidence to support generalizations.	Compile component ideas into a new whole or propose alternative solutions.	Make and defend judgments based on internal evidence or external criteria
Arrange Define Describe Duplicate Identify Label List Match Memorize Name Order Outline Recognize Relate Recall Repeat Reproduce Select State	Classify Convert Defend Describe Discuss Distinguish Estimate Explain Express Extend Generalized Give example(s) Identify Indicate Infer Locate Paraphrase Predict Recognize Rewrite Review Select Summarize Translate	Apply Change Choose Compute Demonstrate Discover Dramatize Employ Illustrate Interpret Manipulate Modify Operate Practice Predict Prepare Produce Relate Schedule Show Sketch Solve Use Write	Analyze Appraise Breakdown Calculate Categorize Compare Contrast Criticize Diagram Differentiate Discriminate Distinguish Examine Experiment Identify Illustrate Infer Model Outline Point out Question Relate Select Separate Subdivide Test	Arrange Assemble Categorize Collect Combine Comply Compose Construct Create Design Develop Devise Explain Formulate Generate Plan Prepare Rearrange Reconstruct Relate Reorganize Revise Rewrite Set up Summarize Synthesize Tell Write	Appraise Argue Assess Attach Choose Compare Conclude Contrast Defend Describe Discriminate Estimate Evaluate Explain Judge Justify Interpret Relate Predict Rate Select Summarize Support Value

Table 2.2: Blooms Taxonomy including subdivision definition and verbs

first attempt to classify learning behaviors and provide measures for identifying different levels of learning. Taxonomies are used with instructional objectives and systematic design of instructional programs (Gagne, Briggs, & Wagner, 1992).

Bloom’s taxonomy has stood the test of time due to its long history and popularity. So much has been written about Bloom’s taxonomy; one click in a search will flood you with articles and links to access. Educators who earned their degrees before 2001 learned about Bloom’s Taxonomy, table 2.2, during their pedagogy classes in their teacher education program in college. Educators who earned their degree after 2001 studied the revised version of Bloom’s Taxonomy.

During the 1990’s a new group of psychologists led by Lorin Anderson, a former student of Bloom, and David Krathwohl, updated the taxonomy to reflect the 21st Century Education. In 2001, a revised Bloom’s Taxonomy was published. The changes occurred in three main categories; terminology, structure, and emphasis, as an authentic toll for curriculum planning, instructional delivery, and assessment (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Rath, & Wittrock (2001).

ACTIVITY: BLOOMS REVISED TAXONOMY

Explore the revised Bloom’s Taxonomy: <http://goo.gl/9Ertg>

PDF version of site: <http://goo.gl/qCQxr>

The significance of Bloom’s taxonomies was that it was the

Bloom’s Revised Taxonomy

The restructure of the original taxonomy recognized the importance of the interaction between the content taught and the verb. Blooms six major categories were changed from noun to verb forms in the new version which was developed in the 1990’s and released in 2001, figure 2.3.

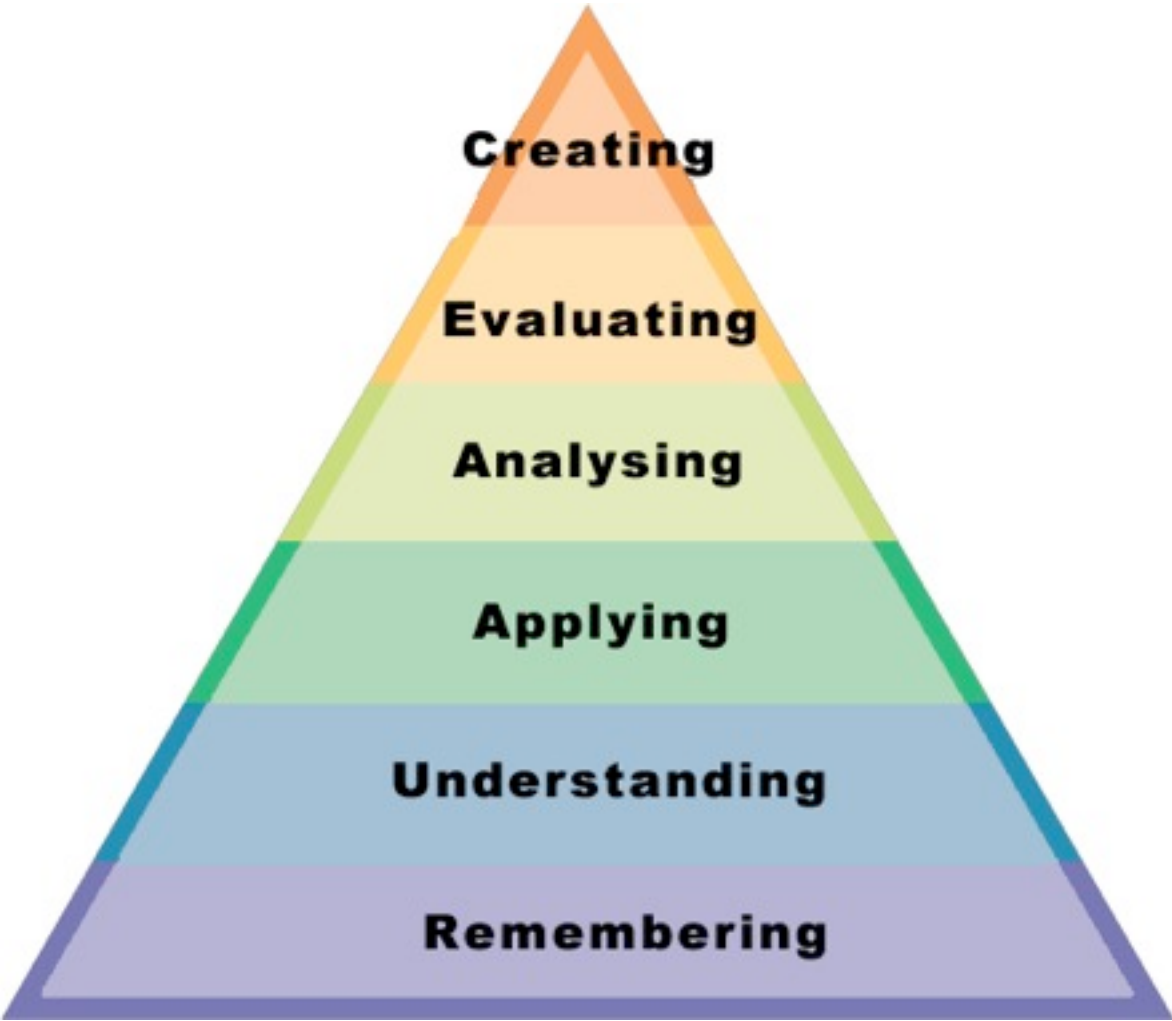


Figure 2.3: Bloom’s cognitive domain and six subdivisions starting with the simplest intellectual behavior.

Figure 2.4 compares the original Bloom’s Taxonomy with the revised Bloom’s Taxonomy. The change in terminology is demonstrated by Bloom’s six subdivision names were changed from nouns to verbs.

Original Domain		Revised Domain
Evaluation		Creating
Synthesis		Evaluating
Analysis		Analyzing
Application		Applying
Comprehension		Understanding
Knowledge		Remembering

Figure 2.4: Comparison of Bloom’s Taxonomy’s.

Structural change in Bloom’s cognitive taxonomy was from a one-dimensional form to a two-dimensional as seen in table Figure 2.5 or Table 2.3; one of the dimensions identifies *The Knowledge Dimension* (kind of learning) while the second dimension identifies *The Cognitive Process Dimension* (process used to learn). For additional information read, **Theory Into Practice**, Volume 41, Number 4, Autumn 2002. (<http://goo.gl/ujgrj>)

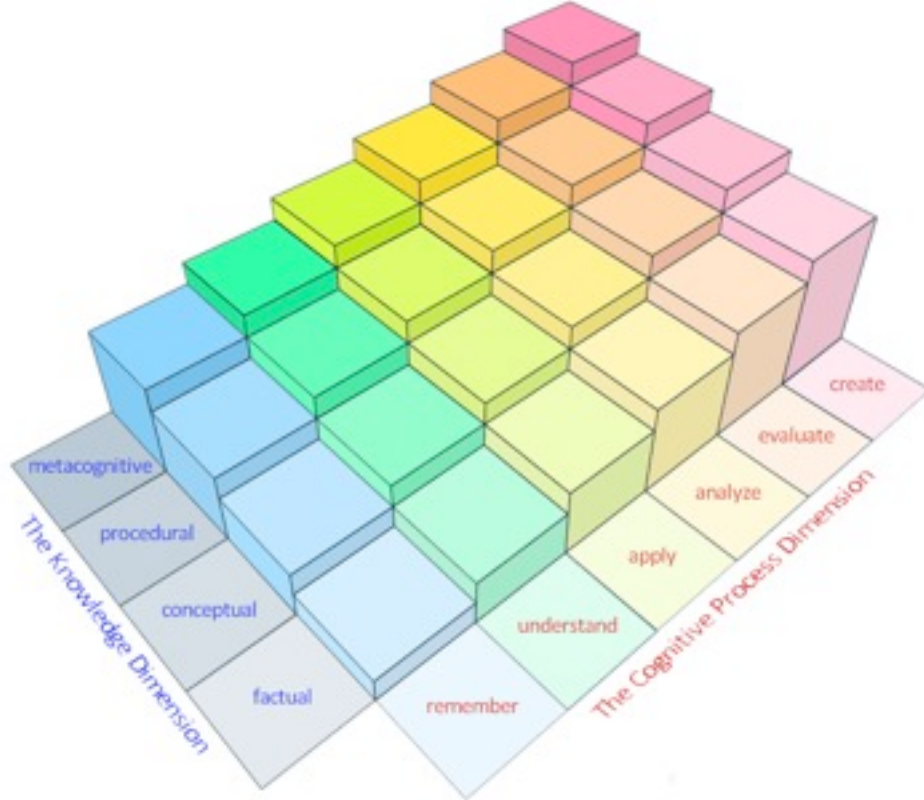


Figure 2.5: Bloom's revised model (Heer, 2009)

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
Factual Knowledge	Remember	Understand	Apply	Analyze	Evaluate	Create
Conceptual Knowledge	List	Summarize	Classify	Order	Rank	Combine
Procedural Knowledge	Describe	Interpret	Experiment	Explain	Assess	Plan
Meta Cognitive Knowledge	Appropriate Use	Execute	Calculate	Achieve	Action	Actualize

Table 2.3 Bloom's two-dimensional form.

Additional Resources:

Web Sites:

- Understanding and Using Bloom's Taxonomy:
<http://farr-integratingit.net/Theory/CriticalThinking/index.htm>
- Georgia Southern University, Online Course Design , Bloom's Taxonomy:
<http://academics.georgiasouthern.edu/col/id/bloom.php>

CATEGORY	EXAMPLE AND KEY WORDS (VERBS)
Creating: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.	<p>Examples: Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises and processes to improve the outcome.</p> <p>Key Words: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.</p>
Evaluating: Make judgments about the value of ideas or materials.	<p>Examples: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget.</p> <p>Key Words: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.</p>
Analyzing: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	<p>Examples: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training.</p> <p>Key Words: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.</p>
Applying: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the workplace.	<p>Examples: Use a manual to calculate an employee's vacation time. Apply laws of statistics to evaluate the reliability of a written test.</p> <p>Key Words: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.</p>
Understanding: Comprehending the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	<p>Examples: Rewrites the principles of test writing. Explain in one's own words the steps for performing a complex task. Translates an equation into a computer spreadsheet.</p> <p>Key Words: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.</p>
Remembering: Recall previously learned information.	<p>Examples: Recite a policy. Quote prices from memory to a customer. Knows the safety rules.</p> <p>Key Words: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.</p>

Table 2.3 : Bloom's Taxonomy Examples.

Webb’s Depth-of-Knowledge Levels

In 1965 Benjamin Bloom identified three domains of learning, cognitive, affective, and psychomotor. The cognitive domain was subdivided into six progressive categories or levels in the development of intellectual skills. As the use of technology has become an integral part of what we do every day and the shift to standards for curriculum and for assessment (Smith & O’Day, 1991), Bloom’s Taxonomy is limited.

To address the concerns Norman Webb (1997) , figure 3.1 on the right , developed a process and criteria for systematically analyzing the alignment between standards and standardized assessment. The body of work created the **Depth of Knowledge (DOK) Model** used to analyze the cognitive expectation demanded by standards, curricular activities and assessment tasks(Webb, 1997). The model



Norman Webb

is based upon the assumption that all curricular elements may be categorized based upon the cognitive demands required to produce an acceptable response (Webb, 1997).

Each grouping of tasks reflects a different level of cognitive expectations, or depth of knowledge, required to complete the tasks, Table 3.1. Webb’s (2002) DOK levels names four different and deeper ways a student might interact with content.

DOK LEVEL	TITLE OF LEVEL
1	Recall and Reproduction: Recall of a fact, term, principle, concept, or perform a routine procedure
2	Basic Application of Skills and Concepts: Use of information, conceptual knowledge, select appropriate procedures for a task, two or more steps with decision points along the way, routine problems, organize/display data, interpret/use simple graphs
3	Short-term Strategic Thinking: Requires reasoning, developing a plan or sequence of steps to approach problems; requires some decision making and justification; abstract, complex, or non-routine; often more than one possible answer.
4	Extended Thinking: An investigation or application to real world; requires time to research, problem solve, and process multiple conditions of the problem or task; non-routine manipulations, across disciplines/content areas/multiple sources

Table 3.1: DOK Levels of tasks.

PONDER/ACTIVITY

Read article on by Hess, Carlock, Jones, & Walkup (2009), What exactly do “fewer, clearer, and higher standards” really look like in the classroom? <http://goo.gl/2YFny>

Webb’s work makes us rethink test alignment regarding the content assessed and the intended cognitive demand (depth for demonstrating understanding of the content) in a text. In other words the complexity of the content and the task is required to determine the DOK level. An example of complexity of content would be viewing simple data to complex data or interpreting or figurative language. An example of the complexity of a task would be solving routine or nonroutine problems where data is provided or requires deduction from the provided content.

PONDER/ACTIVITY

Within a group or on a sheet of paper write down three examples of each:

1. Provide examples of different content complexities for your grade.
2. Provide examples of different task complexities for your

The DOK level should reflect the work required to perform in order for the response to be acceptable, the complexity of the cognitive process (**NOT** the difficulty), and the cognitive demands required by the central performance. In addition, the complexity of the task is impacted by the required prior knowl-

edge at the grade level, and the mental processes used to meet the requirement. Webb’s model dictates that the depth-of-knowledge levels do not need to correlate to the “difficulty” level. That is, an activity at a particular level is not easier than the one above it. The level is referencing “the depth of understanding of the content”.

States have used Webb’s depth-of-knowledge to create standards in order to align the state’s assessment. Teachers need to gain a deeper understanding to create multiple levels of cognitive demand in addressing set standards. Teachers have also needed to ensure their instruction is aligned with the states standards DOK level. The following video 3.1, illustrates the DOK levels along with an example in applying the levels to classroom instruction.

Video 3.1 Webb’s DOK Levels



Webb’s DOK levels are presented along with examples in applying the levels to classroom instruction. Movie created by NYC DOE Promising Practice Plus.

PONDER/ACTIVITY: DOK LEVELS

Determine DOK Levels for each statement below:

1. Student needs to take the issue and connect the concept to a real-world phenomena with supporting evidence.
2. Students need to explain why a rule works.
3. Student needs to restate a simple fact.
4. Student needs to explain how or why a concept works.
5. Student needs to integrate two concepts and provide possible outcomes.
6. Student needs to restate an abstract theory.
7. Student needs to explain where she or he lives.
8. Student needs to describe the difference between metamorphic and igneous rocks.
9. Student needs to describe three characteristics of metamorphic rocks.
10. Student needs to describe a model that may be used to represent the relationship that exist within the rock cycle.
11. Student needs to add 4,678,895 to 9,578,885.
12. Student needs to add 4 to 4.
13. Student needs to develop a generalized model from the data and apply it to the new environment.

Answers located in **Chapter 4**.

Additional Helpful Tip:

Depth of Knowledge..

- Focuses on (**complexity**) of content standards in order to successfully complete and assessment or task.
- The outcome (**product**) is the focus of the depth of understanding.
- What follows the verb is more important than the verb itself when deciding the DOK level.

Depth of Knowledge is **NOT**..

- a taxonomy
- the same as difficulty
- about using verbs

Depth of Knowledge is **ABOUT**..

- the **context** in which the verb is used and the depth of thinking required
- what comes after the verb itself
- intended outcome, not difficulty
- the complexity of mental processing that occur to answer a question, perform a task, or generate a product

When assigning the DOK level one needs to consider:

1. The level of work students are most commonly required to perform
2. The complexity of the task, rather than its difficulty

- 2.1. The DOK level describes the kind of thinking involved in a task, not the likelihood that the task will be completed correctly
- 3. The complete domain of items that would be appropriate for completing the task
 - 3.1. Identify the DOK level of the most common of these items

If there is a question regarding which of two levels an objective addresses, it is usually appropriate to select the higher of the two levels.

TOOL: DOK WHEEL

Helpful tool in designing lessons and assignments to meet various DOK levels.

The DOK wheel document presents Webb's four levels of cognitive complexity providing a definition, keywords, examples, and relationship to answers to questions, tasks, projects, or products.

PDF (<http://goo.gl/pBKo8>)



OPTIONAL ACTIVITY BELOW

- 1. Complete student tasks. Located in **Chapter 2, Section 2**
- 2. Activity 2: Practice identifying DOK levels on student tasks. Located in **Chapter 2, Section 3**

DOK: Curriculum and Assessment Alignment

As the alignment process takes place educators will want to think about the degree to which classroom instruction and assessments are aligned with the demand of content standards. In order for students to reach the cognitive demands of the content they will need well-constructed standards based lessons and assessments. The No Child Left Behind Act (NCLB) now requires states to use an alignment process for validation purposes to show that they are aligning their assessments with the depth of the state's academic content standards at all grade levels. The U.S. Department of Education issued guidelines that included six dimension for alignment of standards and assessments. The six dimensions are: comprehensiveness, content and performance match, emphasis, depth, consistency with achievement standards and clarity for users. Pennsylvania selected Norman Webb's model for meeting this requirement.

The level of a DOK item is determined by the task (defined by complex thinking and reasoning skills), not grade level or ability of the student. DOK levels are ceilings, not targets for aligning expectations with assessments, see Table 3.2. The

“**ceiling**” defines the highest levels of assessment of a Grade Level Expectations (GLE) and the other (lower) levels with potential for assessment items. The “**target**” assumes that *only* the highest level is assessed.

It is important to distinguish between “**ceiling**” and “**target**” for test specifications and test development. If one assessed only at the “target” level, all GLEs with a level 3 as their highest cognitive demand would only be assessed at level three. This could result in the assessment being too difficult and critical information about student learning (do and don’t know) along the achievement continuum would be lost. One method to prevent this is to plan formative assessment strategies and use different tools that focus on different DOK levels. For example, assessments that contains varying levels of DOK that are embedded in the larger more complex task. By creating assessments that contain ranges and end high selected and prioritized content will help in narrow down what students do and do not know. See table 4.2 for an example of different DOK levels within different subject areas.

DEPTH OF KNOWLEDGE DEMONSTRATING ASSESSMENT CEILING		
Level 1 (Recall)...Level 2 (Skill/Concept).. Level 3 (Strategic Thinking)..Level 4 (Extended Thinking)		
Lesson Grade Level Expectation (GLC)	Ceiling: The highest DOK level at which the GLE should be assessed	Potential DOK Level for Assessment:
CCSS.Math.Content. 1.NBT.B.2 • Understand that the two digits of a two-digit number represent amounts of tens and ones.	1	1 Identify in a two digit number the ones place and the tens place.
CCSS.Math.Content. 1.NBT.B.2 • Understand that the two digits of a two-digit number represent amounts of tens and ones.	2	1 Sort manipulative for two digit numbers. 2 Predict two digit number when using manipulative.
CCSS.Math.Content. 1.NBT.B.2 • Understand that the two digits of a two-digit number represent amounts of tens and ones.	3	1 Determine an estimate. 2 Justify a given estimate. 3 Construct models for numbers with two digits and compare the tens and ones.
Table 3.2 Example of how DOK is used in aligning curriculum and assessment		

	LEVEL ONE	LEVEL TWO	LEVEL THREE	LEVEL FOUR
Music	Name several composers from the Baroque and Classical Periods.	Describe differences between Baroque and Classical Period.	Critique, compare, and contrast pieces of music from Baroque and Classical Periods.	Choose a period and develop a 16 measure piece of music from that style.
Agricultural Science	Name two crops that are commonly grown in the State of Pennsylvania.	Make a graph showing the annual production of the 5 largest crops grown in Pennsylvania.	Develop a logical argument for planting a particular crop in your area, taking into account soils, weather, and other variables.	Design a 3 year crop rotation system for a farm of 360 acres, using a little chemical fertilizer as possible. Justify your system. Project the expected cost and revenue.

Hess’ Cognitive Rigor Matrix

Bloom’s Taxonomy addresses cognitive processes and knowledge, and Webb’s Depth of Knowledge (DOK) levels address the complexity of a students assignment content and task, and how they differ in scope and application. Bloom’s Taxonomy categorizes the cognitive skills required to perform a task, and DOK relates to the depth of content understanding and scope of a learning activity required to complete the task. Both Bloom’ Taxonomy and DOK have implications in curricular design, delivery, assessment development, and use.

To help explain how the two conceptual models Bloom’s and Webb’s, are alike yet different (Table 4.1), we will turn to Hess’s Cognitive Rigor (CR) matrix. The CR matrix provides the means to examine the depth of understanding required for different tasks that might at first appear to be comparable levels of complexity. The CR matrix allows educators to categorize and examine selected assignments and learning activities that appear in curriculum and instruction. The CR matrix

graphically displays a unique view of instructional emphasis and ultimately reveals the focus of learning within a classroom.

PONDER/EXAMPLE

- 1. Use the Bloom’s Taxonomy, Webb’s DOK levels, and CR matrix to categorize the following task:
 - **Student Task:** Rote completion of single-step mathematical routines.
- 2. Example answer: DOK level = 1, Bloom’s level = 3, CR matrix = cell 1 and 3
- 3. How do the different charts impact your categorizing?

The Common Core State Standards require high-level cognitive demand, such as asking students to demonstrate deeper conceptual understanding through application of content knowledge and skills to new situation and sustained tasks. See table 4.2, is another way of creating learning activities that address Bloom’s Taxonomy and Webb’s DOK.

DEPTH + THINKING	LEVEL 1 RECALL & REPRODUCTION	LEVEL 2 BASIC SKILLS & CONCEPTS	LEVEL 3 STRATEGIC THINKING & REASONING	LEVEL 4 EXTENDED THINKING
Create Recognize elements into new patterns/ structures, generate, hypothesize, design, plan, construct, produce	Brainstorm ideas about a topic		Synthesize information within one source or text	Synthesize information across multiple sources or text
Evaluate Make judgement based on criteria, check, detect inconsistencies or fallacies, judge, critique			Cite evidence and develop a logical argument for conjectures	Evaluate relevancy accuracy & completeness of information
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant- irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	Identify whether information is contained in a graphic table, etc.	Compare literary elements, terms, facts, events Analyze format, organization, & text structure	Analyze or interpret author's craft (literary devices, viewpoint, or potential bias) to critique a text	Analyze multiple sources or texts Analyze complex/abstract themes
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task.	Use language structure (pre/ suffix) or word relationships (synonym/antonym)	Use context to identify meaning of word Obtain and interpret information using text features	Use concepts to solve non routine problems	Devise an approach among many alternatives to research a novel problem
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion, predict, compare/contrast, match like ideas, explain, construct models	Select appropriate words to use when intended meaning is clearly evident	Specify, explain relationships Summarize Identify main ideas	Explain, generalize, or connect ideas using supporting evidence (quote, example...)	Explain how concepts or ideas specifically relate to other content domains or concepts
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	Recall, locate basic facts, details, event			

Table 4.1 Hess's Cognitive Rigor Matrix applying Bloom's and Webb's models.



	Bloom's	Webb's	Actions	Production	Learning Activity
	Creating (Putting together ideas or elements to develop an original idea or engage in creative thinking).	Webb's Level 3-4	Designing Constructing Planning Producing Inventing Devising Making	Film Story Project Plan New game Song Media product Advertisement Painting	
	Evaluating (Judging the value of ideas, materials and methods by developing and applying standards and criteria).		Checking Hypothesizing Critiquing Experimenting Judging Testing Detecting Monitoring	Debate Panel Report Evaluation Investigation Verdict Conclusion Persuasive Speech	
	Analyzing (Breaking information down into its component elements).		Comparing Organizing Deconstructing Attributing Outlining Structuring Integrating	Survey Database Mobile Abstract Report Graph Spreadsheet Checklist Chart Outline	
	Applying (Using strategies, concepts, principles and theories in new situations).	Webb's Level 1-2	Implementing Carrying out Using Executing	Illustration Simulation Sculpture Demonstration Presentation Interview Performance Diary Journal	
	Understanding (Understanding of given information).		Interpreting Exemplifying Summarizing Inferring Paraphrasing Classifying Comparing Explaining	Recitation Summary Collection Explanation Show and tell Example Quiz List Label Outline	
	Remembering (Recall or recognition of specific information).		Recognizing Listing Describing Identifying Retrieving Naming Locating Finding	Quiz Definition Fact Worksheet Test Label List Workbook	

Table 4.2, Framework for creating learning activities to meet DOK levels. PDF Version <http://goo.gl/4fRri>

Activities

Including rigor in classroom lessons and throughout the curriculum can start with teachers analyzing current lessons and then enhancing them with rigorous activities. Before taking time to analyze your current lessons for rigor, use the activities in this section to check or refresh your understanding of rigor.

- Section 1: Myths Regarding Rigor
- Section 2: DOK levels Activity 1
- Section 3: DOK levels Activity 2
- Section 4: Cognitive Rigor, Activity 1
- Section 5: Cognitive Rigor, Activity 2

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Myths Regarding Rigor

In this section two widely accepted measures of describing cognitive rigor will be used. The first measure is Bloom's Taxonomy of Educational Objectives, and the second measure is Webb's Depth-Of-Knowledge levels. This training will define cognitive rigor and present a matrix that integrates these models as a strategy for analyzing instruction and influencing lesson planning. This will be followed by Hess' Cognitive Rigor Matrix, that demonstrates how curricular items (e.g., assignment questions and problem solving tasks) might align to cells in the matrix.

Ronald Williamson and Barbara R. Blackburn authors of *Schools & Classroom: Leading the Way* and *The Principals from A-Z* have worked with teachers and principals on ways to improve their school. Their efforts have centered on promoting the core concepts of rigor: creating schools where every student is known by adults, where students have a posi-

tive relationship with adults and other students, and where they are challenged to achieve at high levels.

The 3 R's –Rigor, Relevance, and Relationships– have become accepted as necessary characteristics of quality schools, yet there remain many misconceptions and myths regarding rigor. It is time to learn what rigor is and what it isn't.

Activity 1:

Think/Pair/Share Activity.

1. **Step one**, read document by Ronald Williamson and Barbara R. Blackburn covering 4 myths about rigor in the classroom. Link to document: <http://goo.gl/DVYfu>

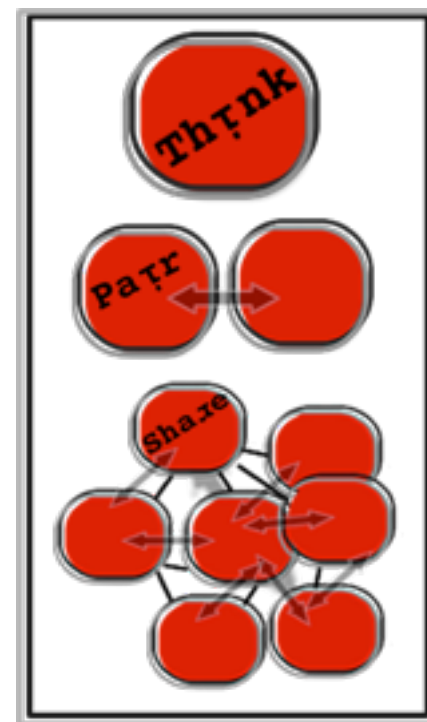
- While you are reading, think about how your group could present this information to parents of your students.

2. **Step two**, working with in a group come up with a way to inform your parents about rigor in your classroom.

3. **Step three**, each group share their end product.

Methods to use for sharing with a group.

- poster paper
- electronic application example Wallwisher (<http://wallwisher.com/>)



DOK Levels Activity 1

During this activity you will be applying Webb's Depth of Knowledge (DOK) levels to different student tasks.

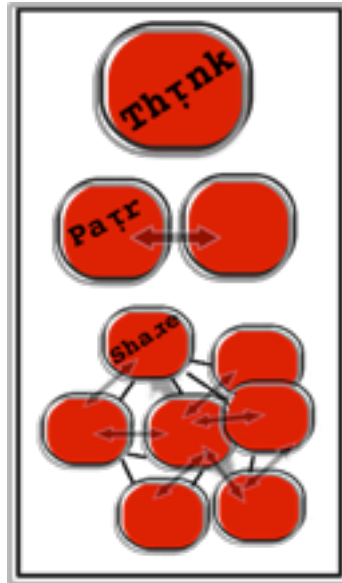
Step one, download a DOK guide to help you determine the DOK Levels for student activities. Webb's DOK wheel (<http://goo.gl/pBKo8>) or DOK guides located in chapter 3, section 1 or 2, can be used as well.

Step two, working with another person or in a small group read and identify the DOK levels for the four student tasks that follows.

Step three, each group comes back to share struggles and success.

Methods to use for sharing with a group.

- poster paper
- electronic application-example Wallwisher (<http://wallwisher.com/>)



Student Tasks:

(1) Math, Grade 4

Each day that Jane turns in her homework on time, she earns 5 points. Jane has turned in her homework on time for the last 8 days. How many points has Jane earned altogether?

- a) 30 b) 35 c) 40 d) 45

(2) Science, Grade 10

A scientist synthesizes a new drug. She wants to test its effectiveness in stopping the growth of cancerous tumors. She decides to conduct a series of experiments on laboratory mice to test her hypothesis. What should she do?

- Give half the mice the drug, the other half none, and compare their tumor rates.
- Give the drug to all mice, but only to half every other day, and record tumor rates.
- Double the dosage to all mice each day until tumors start to disappear.
- Give the drug only to those mice who have tumors and record their weights.

(3) Social Studies, Grade 10-12

A newspaper prints a story that criticizes the current administration's Policies. The Bill of Rights allows a government official to respond to this headline by

- a) arresting the publisher of the newspaper
- b) closing down the newspaper
- c) demanding that the newspaper print a new headline
- d) writing a letter of protest to the editor

(4) Communication Arts, Grade 10

You will become a storyteller. You will research and write the story of someone who has emigrated to the United States and/or migrated within the United States. You will get a role card from your native country, and you will become that person. The role cards feature many countries and many time periods: gender and age are mixed. For example:

- Moira Adair, 50, arriving from Northern Ireland in 1980. Your husband was killed in an IRA bombing. You are a computer expert and have family in Minneapolis.
- Sean Dolan, 21, arriving from Ireland in 1853. You are alone but you have a relative in New York. You are an apprentice stone mason.

1. You must produce an original map showing your home country as it was when you left. Describe the culture (social, economic, political, dominant religious affiliation, educational system, legal system), including the dominant values, customs, and traditions of the culture. Further, note spe-

cific problems in your homeland, explaining why people emigrate to America at that time. The trip to America is the bridge to researching settlement in a specific area or community; this is where imagination takes over for a time, although you will also need to maintain accuracy.

2. The next major research involves the assimilation process in America. Additionally, you need to research the contributions of your ethnic group to America. To guide you through this project, you will receive a packet of materials that includes everything from graphic organizers to specific prompts. The project culminates in an Ellis Island simulation and a “feast” for which you will research and prepare food, music, and dance from your assigned homeland.

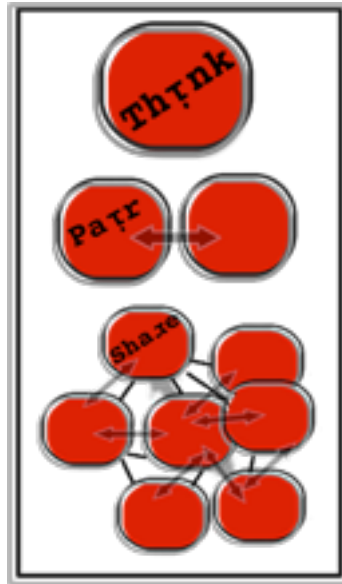
(5) Social Studies/Science, Grade 10-12

Students are given the scenario of acid rain potentially causing problems in a specific farming community. Students are to define and describe the problems with supporting data. There should be a proposal of alternative solutions to the problem, a selection of one solution, and an explanation of why it would be the best alternative. The selected solution must include a plan for implementation.

Answers located in **Chapter 4**.

DOK Levels Activity 2

During this activity you will be applying Webb's Depth of Knowledge (DOK) levels to different student tasks. DOK offers a common language to understand "rigor," or cognitive demand, in assessments, as well as curricular units, lessons, and tasks. Webb developed four DOK levels that grow in cognitive complexity and provide educators a lens on creating more cognitively engaging and challenging tasks.



Think/Pair/Share Activity (Math and Science)

- Step one**, download a DOK guide to help you in determining the DOK Levels for student activities. Webb's DOK wheel (<http://goo.gl/pBKo8>) or DOK guides located in chapter 3, section 1 or 2.
- Step two**, working with another person or in a small group access the Quia website below with the help of your DOK guides to identify DOK levels for each student activity. (<http://www.quia.com/pages/cyberschool/page5>)

- Step three**, each group comes back to share struggles and success.

Methods to use for sharing with a group.

- poster paper
- electronic application example Wallwisher (<http://wallwisher.com/>)

Cognitive Rigor and Implications for Assessment

Questions at lower levels are usually more appropriate for evaluating students' preparation and comprehension, diagnosing students' strengths and weakness, and reviewing and summarizing. Questions at upper DOK levels tend to encourage students to think deeply and critically, problem solve, encourage discussions, and stimulate students to seek information on their own.

Remember:

- Assessing only at the highest DOK level will miss opportunities to know what students do & do not know. Go for a range; end high in selected and prioritized content.
- Performance assessments can offer varying levels of DOK embedded in a larger more complex task.
- Planned formative assessment strategies and tools can focus on different DOK levels.
- High level thinking questions are sometimes easier for Level 1 and 2 students to answer because open-ended questions have more entry points and require more "think time" by the rest of the class.

Cognitive Rigor Activity 1

During this activity you will analyze two tasks and answer three questions. As you work on the questions apply Hess's cognitive matrix, Table 4.1.

PONDER: QUESTION?

1. What is the actual work that students are being asked to do?
2. What do you have to know in order to complete the tasks?
3. What is the actual product of the tasks?
4. If you were a student and completed the task successfully, what would you understand, know, and be able to do?

Task 1:

Students are sitting in groups, facing each other. The teacher begins the lesson by introducing students to the difference between linear equations and linear inequalities. She demonstrates how to graph a linear inequality for students using the following example:

$$y > ax + b$$

The teacher passes out a worksheet with five examples of linear inequalities that follow the form of the example, and she instructs students to graph them following her example. Some students complete the worksheet before others. The teacher circulates through the room answering students' questions. Other students ask the teacher to explain the difference between an equation and inequalities, to which she responds by repeating what she said earlier. At the end of class, she assigns eight more examples, like the ones she asked students to do in class, for homework.

Task 2:

Students are sitting in groups. The teacher briefly presents the difference between a linear equation and a linear inequality. The teacher then distributes a scatter plot of data showing the relationship between the level of hydrocarbons in the atmosphere (x-axis) and the prevalence of respiratory disorders in the human population (y-axis). She instructs students to find a line that represents the "best fit" for the data in the scatter plot, to

write an equation that describes that line, and to explain what the line tells us about the relationship between hydrocarbons and respiratory disorders. She circulates through the groups answering questions about the problem.

The teacher then asks two groups with different answers to present their work. She asks the class to critique their solutions and explanations.

The teacher then asks, “Suppose you wanted to restrict respiratory disorders by controlling air quality. Can you represent what that might look like using a linear inequality expression? Can you use the relationship between the linear equation and the inequality to discuss how much it might cost to reduce respiratory disorders?”

Students graph and write various inequality expressions in response to the teacher’s question. The teacher asks the two groups to present their work, and invites the class to critique their solutions and explanations.

The homework assignment is to write a two-paragraph explanation of the relationship between atmospheric hydrocarbons and respiratory disorders, in the form of a letter to the editor of the local newspaper, and to explain how the evidence might be used to estimate the cost of reducing respiratory disorders. Students will present

their explanations at the beginning of the next day’s class.

Questions:

1. What is being asked of the Task for Task 1 and Task 2?
2. What is the Rigor of Task 1 and Task 2?
3. What are characteristics of a Rigorous Task?

Answers located in **Chapter 4**.

DEPTH + THINKING	LEVEL 1 RECALL & REPRODUCTION	LEVEL 2 BASIC SKILLS & CONCEPTS	LEVEL 3 STRATEGIC THINKING & REASONING	LEVEL 4 EXTENDED THINKING
Create	Brainstorm ideas about a topic		Synthesize information within one source or text	Synthesize information across multiple sources or text
Evaluate			Cite evidence and develop a logical argument for conjectures	Evaluate relevancy accuracy & completeness of information
Analyze	Identify whether information is contained in a graphic table, etc.	Compare literary elements, terms, facts, events Analyze format, organization, & text structure	Analyze or interpret author’s craft (literary devices, viewpoint, or potential bias) to critique a text	Analyze multiple sources or texts Analyze complex/ abstract themes

Cognitive Rigor Activity 2

In this activity your will be applying your rigor definition to a classroom task. The task that your class just finished was to read some version of *Little Red Riding Hood*. Your next step is to complete some formative and or summative assessment regarding their comprehension.

PONDER: QUESTION?

- 1. What would be the basic comprehension question(s) you might ask your class after they just read a version of *Little Red Riding Hood* ?
- 2. Write your question(s) down on a sheet of paper.
- 3. Using the question(s) you came up with, determine Bloom’s Taxonomy level and Web DOK level.

Bloom’s and Webb’s models each address each question differently. Bloom’s model addresses the type of thinking that can

be denoted by the type of verbs used. Webb’s model addresses the depth of understanding of the content to successfully complete the task. Verbs may appear to point to DOK levels, but it is what comes after the verb that is the best indicator of the rigor and DOK level. See examples below.

PONDER: EXAMPLES OF DIFFERENT DOK LEVELS

- 1. Describe the physical features of a plant.
- 2. Describe how the two political parties are alike and different.
- 3. Describe the most significant effect of WWII on the nation of Europe.

DOK is about depth and complexity not difficulty. The next task is for you or your group to complete the Cognitive Rigor Matrix located on next page for *Little Red Riding Hood* .

DEPTH + THINKING	LEVEL 1 RECALL & REPRODUCTION	LEVEL 2 BASIC SKILLS & CONCEPTS	LEVEL 3 STRATEGIC THINKING & REASONING	LEVEL 4 EXTENDED THINKING
Create				
Evaluate				

- Download Hess' blank Cognitive Rigor Matrix Sheet. <http://goo.gl/ZSUHd> : PDF: <http://goo.gl/QzfOq>
- Sample DOK answers for Little Red Riding Hood. <http://goo.gl/JYup1>
- You may try this same activity with other stories, e.g., *Charlotte's Web*, *Hunger Games*, ...

Answers located in **Chapter 4**.

- Section 1: DOK Levels
- Section 2: DOK Subject Guides
- Section 3: DOK Levels for Science
- Section 4: Web Resources



DOK' s Levels

Level 1 : Recall & Reproduction

Curricular elements involve basic tasks that require students to recall or reproduce knowledge and/or skills. There is little transformation or extended processing of the target knowledge required by the tasks that fall into this category.

Key words: list, identify and define.

Answer: There is an **answer**, and student know the answer or does not. The student does not need to '*figure out*' or '*solve*' the answer.

Examples:

1. Make a timeline
2. Write a list of keywords you know about...
3. Recite a fact related to ...
4. Write and perform ...
5. Retell in your own words

6. Outline the main points
7. Paraphrase a chapter in the book
8. Cut out, or draw a picture that illustrates an event, process, or story.
9. Make a chart showing..
10. Locating information in maps, charts, tables, graphs, and drawings.

Level 2 : Working with Skills & Concepts

Curricular elements involve basic tasks requiring students to engage in some mental processing beyond recalling or reproducing a response. This level requires students to contrast or compare people, places, events and concepts; convert information from one form to another; classify or sort items into meaningful categories; describe or explain issues and problems, patterns, cause and effect, significance or impact, relationships, points of view or processes.

Key words: describe or explain a result or how or why.

Answer: There is an **answer**, and student should make use of information in a context different from the one in which it was learned.

Examples:

1. Classify a series of steps
2. Construct a model to demonstrate how it looks or works
3. Write a blog entry
4. Make up puzzle or game about the topic
5. Explaining the meaning of a concept
6. Stating relationships among a number of concepts
7. Complex calculation tasks (e.e. standard deviation)

Level 3 : Short-Term Strategic Thinking

Curricular elements demand a short-term use of higher order thinking processes, such as analysis and evaluation, to solve real-world problems with predictable outcomes. Tasks at this level tend to require coordination of knowledge and skill from multiple subject-matter areas to carry out processes and reach a solution.

Key words: analyze, explain and support with evidence, generalize, and create.

Answer: There is not just one correct **answer**, but multiple answer and different approaches.

Examples:

1. Use a Venn Diagram that shows how two topics are the same and different
2. Design a questionnaire to gather information
3. Make a flow chart to show the critical stages
4. Prepare a report about an area of study
5. Prepare and conduct a debate
6. Write a persuasive speech arguing for/against...
7. Make a booklet about you see as important. Convince others.
8. Form a panel to discuss viewpoints on...
9. Complex calculation problems presented that draw upon multiple process.
10. Creating graphs, tables and charts where students must reason through and organize the information with instructor prompts
11. Develop a scientific model for a complex idea
12. Propose and evaluate solutions for an economic problem

Level 4 : Extended Strategic Thinking

Curricular elements demand extended use of higher order thinking processes such as synthesis, reflection, assessment and adjustment of plans **over time**. Students are engaged in conducting investigations to solve real-world problems with unpredictable outcomes. (Very complex!)

Key words: synthesize, reflect, conduct, and manage

Answer: There is no one answer, but answers supported by data.

Examples:

1. Applying information to solve ill-defined problems in novel situations.
2. Tasks that require a number of cognitive and physical skills in order to complete.
3. Writing and/or research tasks that involve formulating and testing hypotheses over time.
4. Writing a jingle to advertise a new product
5. Sell an idea
6. Writing tasks that have a strong emphasis on persuasion
7. Create an exercise plan applying the 'FITT' (Frequency, Intensity, Time, Type) principle and include the why information and possible challenges and solutions.
8. Analyzing author's craft (e.g., style, bias, literary techniques, point of view)
9. Developing a generalized model from the given data and apply it to a new situation.

DOK Subject Guides

MATH

Level 1 Recall and Reproduction

Level 1 requires the **recall of information** such as a **fact, definition, term**, or a **simple procedure**, as well as performing a simple algorithm or applying a formula. That is, in mathematics a **one-step, well-defined**, and **straight algorithmic procedure** should be included at this lowest level. Other key words that signify a Level 1 include “**identify**,” “**recall**,” “**recognize**,” “**use**,” and “**measure**.” Verbs such as “describe” and “explain” could be classified at different levels depending on what is to be described and explained.

- Recall or recognize a fact, term or property
- Represent in words, pictures or symbols in a math object or relationship
- Perform routine procedure like measuring

Level 2. Skills and Concepts (Math)

Level 2 requires includes the engagement of some **mental processing beyond a habitual response**. A Level 2 assessment item requires students to make some decisions as to **how to approach the problem or activity**, whereas Level 1 requires students to demonstrate a **rote response**, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include “**classify**,” “**organize**,” “**estimate**,” “**make observations**,” “**collect and display data**,” and “**compare data**.” These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects.

Some action verbs, such as “explain,” “describe,” or “interpret” could be classified at different levels depending on the object of the action. For example, if an item required students to explain how light affects mass by indicating there is a relationship between light and heat, this is considered a Level 2.

Level 2 Vs. Level 3

Interpreting information from a **simple graph**, requiring reading information from the graph, also is a Level 2. Interpreting information from a **complex graph** that requires some decisions on what **features of the graph need to be considered** and how information from the graph can be aggregated is a Level 3. Caution is warranted in interpreting Level 2 as only skills because some reviewers will interpret skills very narrowly, as primarily numerical skills, and such interpretation excludes from this level other skills such as visualization skills and probability skills, which may be more complex simply because they are less common. Other Level 2 activities include **explaining** the purpose and **use of experimental procedures**; **carrying out experimental procedures**; **making observations and collecting data**; **classifying, organizing, and comparing data**; and **organizing and displaying data** in tables, graphs, and charts.

- Specify and explain relationships between facts, terms, properties or operations
- Select procedure according to criteria and perform it
- Solve routine multiple-step problems

Level 3. Strategic Thinking (Math)

Level 3 requires requires **reasoning**, **planning**, using evidence, and a **higher level of thinking** than the previous two levels. In most instances, requiring students to **explain** their thinking is a Level 3. Activities that require students to **make conjectures** are also at this level. The cognitive demands at Level 3 are **complex** and **abstract**. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more **demanding reasoning**. An activity, however, that has more than one possible answer and requires students to **justify the response** they give would most likely be a Level 3. Other Level 3 activities include **drawing conclusions from observations**; **citing evidence** and developing a **logical argument for concepts**; explaining phenomena in terms of concepts; and using concepts to solve problems.

- Analyze similarities and differences between procedures
- Formulate original problem given situation
- Formulate mathematical model for complex situation

Level 4. Extended Thinking (Math)

Level 4 requires requires **complex reasoning**, **planning**, **developing**, and **thinking most likely** over an extended period of time. The extended time period is not a distinguishing factor if the required work is only **repetitive** and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into con-

sideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to **make several connections—relate ideas within the content area** or among content areas—and have to **select** one approach among **many alternatives** on how the situation should be solved, in order to be at this highest level. Level 4 activities include **designing and conducting experiments**; **making connections** between a **finding and related concepts and phenomena**; **combining** and **synthesizing ideas** into new concepts; and **critiquing experimental designs**.

- Apply mathematical model to illuminate a problem, situation
- Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
- Design a mathematical model to inform and solve a practical or abstract situation

Science

Level 1. Recall and Reproduction

Level 1 is the recall of information such as a **fact**, **definition**, **term**, or a **simple procedure**, as well as performing a **simple science process or procedure**. Level 1 only requires students to demonstrate a **rote response**, use a **well-known formula**, follow a **set procedure** (like a recipe), or perform a clearly defined series of steps. A “simple” procedure is well-defined and typically involves only one-step. Verbs such as “**identify**,” “**recall**,” “**recognize**,” “**use**,” “**calculate**,” and “**measure**” generally represent cognitive work at the recall and reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as “describe” and “explain” could be classified at different DOK levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not: that is, the answer does not need to be “figured out” or “solved.” In other words, if the knowledge necessary to answer an item automatically provides the answer to the item, then the item is at Level 1. If the knowledge necessary to answer the item does not automatically provide the answer, the item is at least at Level 2. Some examples that represent but do not constitute all of Level 1 performance are:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure such as measuring length.

Level 2. Skills and Concepts

Level 2 includes the engagement of some mental processing beyond re-

calling or reproducing a response. The content knowledge or process involved is more complex than in level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include “**classify**,” “**organize**,” “**estimate**,” “**make observations**,” “**collect and display data**,” and “**compare data**.” These actions **imply more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Level 2 activities include **making observations** and **collecting data**; **classifying**, **organizing**, and **comparing data**; and **organizing** and **displaying data** in tables, graphs, and charts. Some action verbs, such as “explain,” “describe,” or “interpret,” could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a **simple** graph, requiring reading information from the graph, is a Level 2. An item that requires interpretation from a **complex** graph, such as **making decisions** regarding features of the graph that need to be **considered** and how information from the graph can be **aggregated**, is at Level 3. Some examples that represent, but do not constitute all of Level 2 performance, are:

- Specify and explain the relationship between facts, terms, properties, or variables.
- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem given data and conditions.
- Organize, represent and interpret data.

Level 3. Strategic Thinking

Level 3 requires **reasoning**, **planning**, **using evidence**, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are **complex** and **abstract**. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires **more de-**

manding reasoning. In most instances, requiring students **to explain their thinking** is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to **justify the response** they give would **most likely** be a Level 3. Experimental designs in Level 3 **typically** involve more than one dependent variable. Other Level 3 activities include **drawing conclusions from observations; citing evidence and developing a logical argument** for concepts; **explaining phenomena in terms of concepts; and using concepts to solve non-routine problems**. Some examples that represent, but do **not** constitute all of Level 3 performance, are:

- Identify research questions and design investigations for a scientific problem.
- Solve non-routine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

Level 4. Extended Thinking

Tasks at Level 4 have **high cognitive demands** and are **very complex**. Students are required to **make several connections**—relate ideas within the content area or among content areas—and **have to select or devise one approach among many alternatives** on how the situation can be solved. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. “Develop generalizations of the results obtained and the strategies used and apply them to new problem situations,” is an example of a Grade 8 objective that is a Level 4. Many, but not all, **performance assessments** and **open-ended assessment activities** requiring **significant thought** will be Level 4.

Level 4 requires **complex reasoning, experimental design** and planning, and probably will require an **extended period of time** either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires **taking into consideration a number of variables**, this would be a Level 4. Some examples that represent but do not constitute all of a Level 4 performance are:

- Based on provided data from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.
- Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions.

Social Studies

Level 1. Recall and Reproduction

Level 1 asks students to **recall facts, terms, concepts, trends, generalizations** and theories or to recognize or identify specific information contained in graphics. This level generally requires students to **identify, list, or define**. The items at this level usually ask the student to **recall who, what, when** and **where**. Items that require students to “describe” and “explain” could be classified at Level 1 or 2 depending on what is to be described and explained. A Level 1 “describe or explain” would recall, recite or reproduce information. Items that require students to recognize or identify specific information contained in maps, charts, tables, graphs or drawings are generally level 1. Examples:

- Recall or recognize an event, map or document.
- Describe the features of a place or people.
- Identify key figures in a particular context.

Level 2. Basic Reasoning

Level 2 includes the engagement of some **mental processing beyond recalling** or reproducing a response. This level generally requires students to **contrast or compare people, places, events** and **concepts; convert information from one form to another; classify or sort items into meaningful categories ; describe or explain issues and problems, patterns , cause and effect, significance or impact, relationships, points of view or processes**. A Level 2 “describe or explain” would require students to go beyond a description or explanation of recalled information to describe or explain a result or “how” or “why.” Examples:

- Describe the causes/effects of particular events.
- Identify patterns in events or behavior.
- Categorize events or figures into meaningful groups

Level 3. Strategic Thinking

Level 3 requires reasoning, using evidence, and a higher level of thinking than the previous two levels. Students would go beyond knowing

“how and why” to justifying the “how and why” through **application and evidence**. The cognitive demands at Level 3 are more **complex** and more **abstract** than Levels 1 or 2. Items at Level 3 include **drawing conclusions; citing evidence; using concepts to explain “how and why;” using concepts to solve problems; analyzing similarities and differences in issues and problems; proposing and evaluating solutions to problems; recognizing and explaining misconceptions or making connections across time** and place to **explain a concept or big idea**. Examples:

- Analyze how changes have affected people or places.
- Apply concept in other contexts.
- Form alternate conclusions

Level 4. Extended Thinking

Level 4 requires even more **complex reasoning** and the **addition of planning, investigating, or developing** that will most **likely** require an extended period of time. The extended time period is **not** a distinguishing factor if the required work is only repetitive and does not require applying **significant conceptual understanding** and **higher-order thinking**. At this level the **cognitive demands** should be **high** and the work should be very **complex**. Students should be required to **connect and relate ideas and concepts within** the content area or **among** content areas in order to be at this highest level. The distinguishing factor for Level 4 would be **evidence through a task or product** that the cognitive demands have been met. A Level 4 performance will require students to **analyze and synthesize information from multiple sources, examine and explain alternative perspectives** across a variety of sources and/or **describe and illustrate how common themes and concepts** are found across time and place. In some Level 4 performance students will **make predictions** with evidence as support, develop a logical argument, or **plan and develop solutions** to problems. Examples:

- Given a situation/problem research, define and describe the situation/problem and provide alternative solutions.
- Describe, define and illustrate common social, historical, or geographical themes and how they interrelate.

Language Arts Reading

Level 1. Recall and Reproduction

Level 1 requires students to **receive** or **recite facts** or to use simple skills or abilities. Oral reading that does not include analysis of the text as well as basic comprehension of a text is included. Items require only a **shallow understanding** of text presented and often consist of **verbatim recall** from text or simple understanding of a single word or phrase. Some examples that represent but do not constitute all of Level 1 performance are:

- Support ideas by reference to details in the text.
- Use a dictionary to find the meaning of words.
- Identify figurative language in a reading passage.

Level 2 Basic Reasoning

Level 2 includes the engagement of some **mental processing beyond recalling** or reproducing a response; it requires both **comprehension** and subsequent **processing** of text or portions of text. Intersentence analysis of inference is required. Some important concepts are covered but not in a complex way. Standards and items at this level may include words such as **summarize, interpret, infer, classify, organize, collect, display, compare, and determine whether fact or opinion**. Literal main ideas are stressed. A Level 2 assessment item may require some of the skills and concepts that are covered in Level 1. Some examples that represent but do not constitute all of Level 2 performance are:

- Use context cues to identify the meaning of unfamiliar words.
- Predict a logical outcome based on information in a reading selection.
- Identify and summarize the major events in a narrative.

Some examples that represent but **do not constitute all of Level 3** performance are:

- Determine the author's purpose and describe how it affects the interpretation of a reading selection.

- Summarize information from multiple sources to address a specific topic.
- Analyze and describe the characteristics of various types of literature.

Level 3. Complex Reasoning

Level 3 includes deep knowledge becomes more of a focus at Level 3. Students are encouraged to **go beyond the text**; however, they are still required to show understanding of the ideas in the text. Students may be encouraged to **explain, generalize, or connect ideas**. Standards and items at Level 3 involve **reasoning** and **planning**. Students must be able to support their thinking. Items may involve **abstract theme identification, inference across an entire passage**, or students' application of prior knowledge. Items may also involve more superficial connections between texts. Some examples that represent but do not constitute all of Level 3 performance are:

- Determine the author's purpose and describe how it affects the interpretation of a reading selection.
- Summarize information from multiple sources to address a specific topic.
- Analyze and describe the characteristics of various types of literature.

Level 4 Extended Reasoning

Level 4 higher order thinking is central and knowledge is deep at Level 4. The standard or assessment item at this level will probably be an **extended activity**, with **extended time provided**. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. Students take information from at least one passage and are asked to **apply this information to a new task**. They may also be asked to **develop hypotheses** and **perform complex analyses** of the connections among texts. Some examples that represent but do **not** constitute all of Level 4 performance are:

- Analyze and synthesize information from multiple sources.

- Examine and explain alternative perspectives across a variety of sources.
- Describe and illustrate how common themes are found across texts from different cultures.

Language Arts Writing

Level 1. Recall and Reproduction

Level 1 requires the student to **write** or **recite simple facts**. This writing or recitation does not include complex synthesis or analysis but basic ideas. The students are engaged in **listing ideas** or words as in a brainstorming activity prior to written composition, are engaged in a **simple spelling** or **vocabulary assessment** or are asked to **write simple sentences**. Students are expected to write and speak using Standard English conventions. This includes using appropriate **grammar, punctuation, capitalization, and spelling**. Some examples that represent but do not constitute all of Level 1 performance are:

- Use punctuation marks correctly.
- Identify Standard English grammatical structures and refer to resources for correction.

Level 2 Basic Reasoning

Level 2 requires **some mental processing**. At this level students are engaged in **first draft writing** or **brief extemporaneous speaking** for a limited number of purposes and audiences. Students are beginning to connect ideas using a **simple organizational structure**. For example, students may be engaged in **note-taking, outlining or simple summaries**. Text may be limited to one paragraph. Students demonstrate a basic understanding and appropriate use of such **reference materials** as a dictionary, thesaurus, or web site. Some examples that represent but do not constitute all of Level 2 performance are:

- Construct compound sentences.
- Use simple organizational strategies to structure written work.
- Write summaries that contain the main idea of the reading selection and pertinent details.

Level 3. Complex Reasoning

Level 3 requires some higher level mental processing. Students are engaged in **developing compositions** that include multiple paragraphs. These compositions may include **complex sentence structure** and may demonstrate some **synthesis** and **analysis**. Students show **awareness of their audience** and **purpose** through focus, organization and the use of appropriate compositional elements. The use of appropriate compositional elements includes such things as **addressing chronological order** in a narrative or **including supporting facts and details** in an informational report. At this stage students are engaged in **editing** and **revising** to **improve the quality** of the composition. Some examples that represent but do not constitute all of Level 3 performance are:

- Support ideas with details and examples.
- Use voice appropriate to the purpose and audience.
- Edit writing to produce a logical progression of ideas.

Level 4 Extended Reasoning

Level 4 ,higher-level thinking is central to Level 4. The standard at this level is a **multi- paragraph composition** that demonstrates **synthesis** and **analysis** of complex ideas or themes. There is evidence of a **deep awareness of purpose and audience**. For example, informational papers include **hypotheses** and **supporting evidence**. Students are expected to **create compositions** that demonstrate a **distinct voice** and that **stimulate the reader** or **listener** to consider new perspectives on the addressed ideas and themes. An example that represents but does not constitute all of Level 4 performance is:

- Write an analysis of two selections, identifying the common theme and generating a purpose that is appropriate for both.

SECTION 3

DEPTH-OF-KNOWLEDGE LEVELS FOR SCIENCE

DETAILED DESCRIPTORS OF DEPTH-OF-KNOWLEDGE LEVELS FOR SCIENCE			
Level 1 Recall & Reproduction	Level 2 Skills & Concepts	Level 3 Strategic Thinking	Level 4 Extended Thinking
<p>a. Recall or recognize a fact, term, definition, simple procedure (such as one step), or property</p> <p>b. Demonstrate a rote response</p> <p>c. Use a well-known formula</p> <p>d. Represent in words or diagrams a scientific concept or relationship</p> <p>e. Provide or recognize a standard scientific representation for simple phenomenon</p> <p>f. Perform a routine procedure, such as measuring length</p> <p>g. Perform a simple science process or a set procedure (like a recipe)</p> <p>h. Perform a clearly defined set of steps</p> <p>i. Identify, calculate, or measure</p> <p>NOTE: If the knowledge necessary to answer an item automatically provides the answer, it is a Level 1.</p>	<p>A.Specify and explain the relationship between facts, terms, properties, or variables</p> <p>B.Describe and explain examples and non examples of science concepts</p> <p>C.Select a procedure according to specified criteria and perform it</p> <p>D.Formulate a routine problem given data and conditions</p> <p>E.Organize, represent, and compare data</p> <p>F.Make a decision as to how to approach the problem</p> <p>G.Classify, organize, or estimate</p> <p>H.Compare data</p> <p>I.Make observations</p> <p>J.Interpret information from a simple graph</p> <p>K.Collect and display data</p> <p>NOTE: If the knowledge necessary to answer an item does not automatically provide the answer, then the item is at least a Level 2. Most actions imply more than one step.</p> <p>NOTE: Level 3 is complex and abstract. If more than one response is possible, it is at least a Level 3 and calls for use of reasoning, justification, evidence, as support for the response.</p>	<p>a. Interpret information from a complex graph(such as determining features of the graph or aggregating data in the graph)</p> <p>b. Use reasoning, planning, and evidence</p> <p>c. Explain thinking (beyond a simple explanation or using only a word or two to respond)</p> <p>d. Justify a response</p> <p>e. Identify research questions and design investigations for a scientific problem</p> <p>f. Use concepts to solve non-routine problems/more than one possible answer</p> <p>g. Develop a scientific model for a complex situation</p> <p>h. Form conclusions from experimental or observational data</p> <p>i. Complete a multi-step problem that involves planning and reasoning</p> <p>j. Provide an explanation of a principle</p> <p>k. Justify a response when more than one answer is possible</p> <p>l. Cite evidence and develop a logical argument for concepts</p> <p>m. Conduct a designed investigation</p> <p>n. Research and explain a scientific concept</p> <p>o. Explain phenomena in terms of concepts</p>	<p>a. Select or devise approach among many alternatives to solve problem</p> <p>b. Based on provided data from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.</p> <p>c. Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions</p> <p>d. Relate ideas within the content area or among content areas</p> <p>e. Develop generalizations of the results obtained and the strategies used and apply them to new problem situations</p> <p>NOTE: Level 4 activities often require an extended period of time for carrying out multiple steps; however, time alone is not a distinguishing factor if skills and concepts are simply repetitive over time.</p>

Tale 3.1: Details descriptors of Depth-of Knowledge Level for Science(Hess, 2005).

Web Resources

Informational Resources

- Official Common Core Site: <http://www.corestandards.org/>
- Common Core SAS:
<http://www.pdesas.org/Standard/CommonCore>
- Council of Chief State School Officers: <http://goo.gl/kAnnN>
- Clickable CCSS Math powerpoint: <http://goo.gl/yskeK>
- Achieve: <http://www.achieve.org/>
- Understanding and Using Bloom's Taxonomy:
<http://farr-integratingit.net/Theory/CriticalThinking/index.htm>
- Georgia Southern University, Online Course Design ,
Bloom's Taxonomy:
<http://academics.georgiasouthern.edu/col/id/bloom.php>

Open Educational Resources

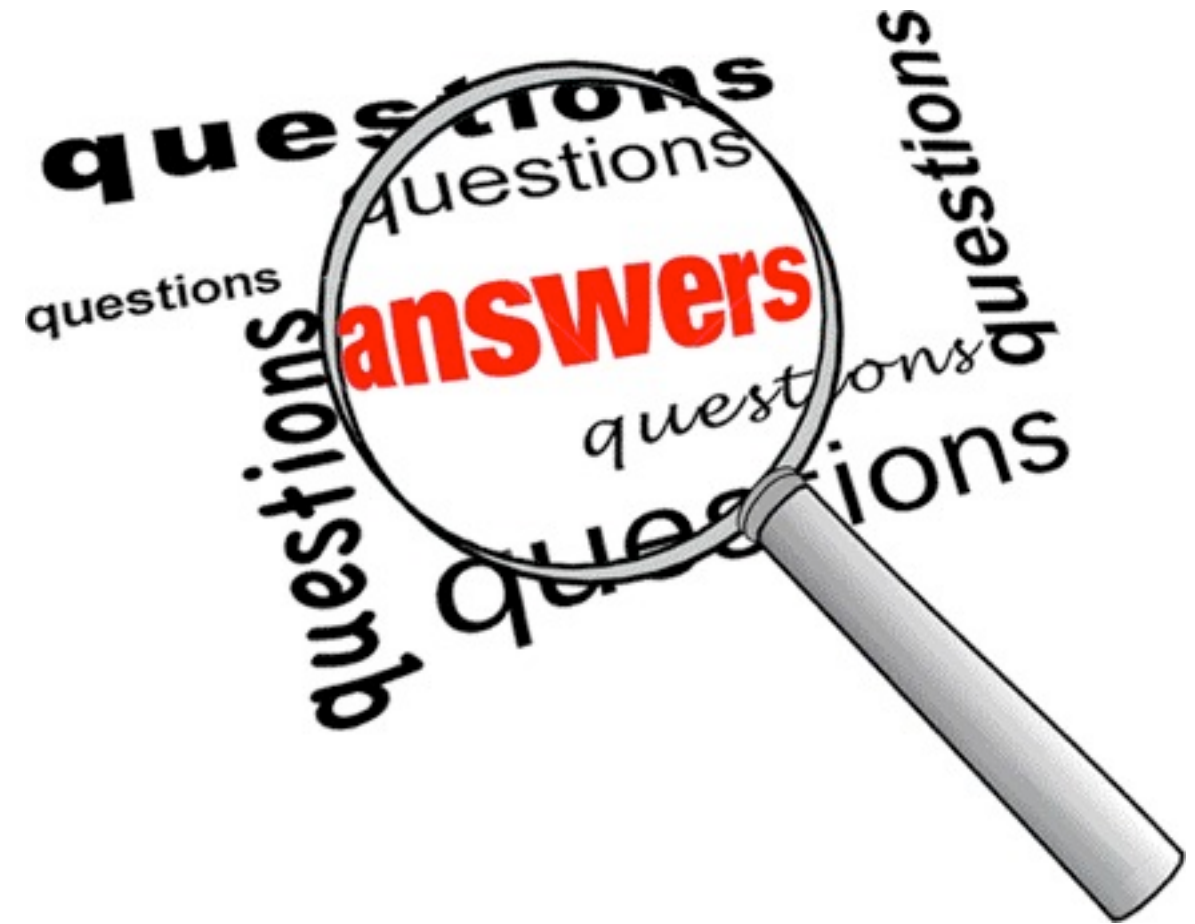
- Share My Lesson: <http://goo.gl/JMR2s>

- RES iboard: <http://goo.gl/6Mtex>
- OER Commons: <http://www.oercommons.org/>
- Learn Zillion: <http://learnzillion.com/>

Answers

Educators's guide to content activities:

- Chapter 1, Section 3, page 15
Determine DOK levels Activity #1
- Chapter 1, Section 3, page 21
Determining DOK levels activity #2
- Chapter 1, Section 3, page
Hess's Cognitive Rigor Matrix Activity



Answers:

Chapter 1, Section 3, page 15

Determine DOK levels Activity #1

1. Student needs to the concept to a real-world phenomena with supporting evidence.3
2. Student need to explain why a rule works.2
3. Student needs to restate a simple fact. 1
4. Student needs to explain how or why a concept works.2
5. Student needs to integrate two concepts and provide possible outcomes. 4
6. Student needs to restate an abstract theory.1
7. Student needs to explain where they live. 1 (recalling and reciting.)
8. Student needs to describe the difference between metamorphic and igneous rocks. 2
9. Student needs to describe three characteristics of metamorphic rocks. 1
10. Student needs to describe a model that you might use to represent the relationship that exist within the rock cycle. 3
11. Student needs to add 4,678,895 to 9,578,885. 1
12. Student needs to add 4 to 4. 1

Back to page 15 DOK Levels activity #1

Chapter 1, Section 3, page 21

Determining DOK levels activity #2

(1) Math Grade 4 DOK

The fact that this is a story problem does not make this more than a level 1 item. The text here quickly reveals that the problem is simple multiplication. However, story problems can often have higher DOK levels even if the computations required are only level 1, as long as there is some skillful or strategic thinking required in determining what computations to perform.

(2) Science, Grade 10 DOK

This item is level 2. Students must at least apply knowledge of controlled experiment design to this situation, or derive it from this problem.

(3) Social Studies , Bill of Rights

This item is level 3 because it requires students to apply the concepts of the Bill of Rights to a given situation represented by the newspaper headline to determine the correct answer.

(4) Communication Arts, Grade 10

This task is an example of level 4. The extended activity described requires the completion of several assignments that would clearly represent Level 4 reasoning in a variety of objective.

(5) Social Studies/Science Acid Rain

The students would investigate, plan, and develop solutions to a problem. This task goes beyond using concepts to solve problems and citing evidence by requiring evidence of the process and the inclusion of an implementation plan. An activity that required students to apply problem-solving criteria to possible solution in order to select the best solution would be Level 3. The addition of both the investigation to gather data that will be used as evidence of the problem and implementation plan makes this task a Level 4.

Chapter 1, Section 3, page

Hess's Cognitive Rigor Matrix Activity

Task A

- Graph 5 linear inequalities
- Follow a procedure provided by the teacher
- More of the same for homework

Task B

- Find line of best fit.

- Correlate data
- Write equation; explain what line says.
- Present work
- Critique work
- Apply/manipulate/
- Change relationship
- Language demand = high

Characteristics of Rigorous Task?

- Applying content to real world; real-world significance; beyond the classroom
- Demands higher levels of thinking (non-routine)
- “Communal” aspect; more communication
- Constructing knowledge
- Requires problem-solving
- Higher-order thinking
- Teaching to others
- Convey content ideas in multiple formats
- Allows for knowledge from other content areas

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21st Century Skills

Are skills students need to be successful in the 21st century. They include: cross-curricular skills and learning to learn skills.

Related Glossary Terms

Drag related terms here

Index

Active Literacy

The integration of critical language skills: listening, speaking, reading and writing into the daily curriculum in every class.

Related Glossary Terms

Drag related terms here

Index

Alignment

Agreement between the essential questions, content, skills, assessments, and the standards adopted by the district. Maps provide the following alignment: internal alignment, external alignment to standards, and cumulative alignment K-12.

Related Glossary Terms

Drag related terms here

Index

Assessment

The various kinds of assessments that allow students to demonstrate their learning.
For example quizzes, tests, portfolios, essays, etc..

Related Glossary Terms

Drag related terms here

Index

Benchmarks

Specific developmental statements regarding performance based standards.

Related Glossary Terms

Drag related terms here

Index

Content standards

Content standards refer to the knowledge and skills that students should acquire in a particular subject area.

Related Glossary Terms

Drag related terms here

Index

Curriculum Mapping

Is a systemic process for guiding student’s performance by aligning all aspects of the curriculum and reducing repetitions, gaps, and for strengthening the articulation of skills.

Related Glossary Terms

Drag related terms here

Index

Depth-of-Knowledge Consistency

Measures the degree to which the knowledge elicited from students on the assessment is as complex within the context area as what students are expected to know and do as stated in the standards.

Related Glossary Terms

Drag related terms here

Index

Differentiation

The process of modifying or delineating some aspect of instruction: the content, process, product, and/or learning environment to address the needs of the learners.

Related Glossary Terms

Drag related terms here

Index

Essential Questions

Over-arching questions that focus based on a key concept, enduring understanding, and/or big idea to prompt inquiry.

Related Glossary Terms

Drag related terms here

Index

Growth measures

Follow the same cohort of students across years, and are able to show, for example, how much fifth graders have gained compared to their performance as fourth graders the previous year

Related Glossary Terms

Drag related terms here

Index

Performance standards

Are “concrete examples and explicit definitions of what students have to know and be able to do” to demonstrate proficiency in the skills and knowledge outlined by the content standards.

Related Glossary Terms

Drag related terms here

Index

Portfolios

Is a representative collection of a person’s work that serves as evidence of understanding.

Related Glossary Terms

Drag related terms here

Index

Find Term

Range-of-Knowledge Correspondence

Determines whether the span of knowledge expected of students on the basis of a standard corresponds to the span of knowledge that students need in order to correctly answer the corresponding assessment items/activities.

The “ceiling” defines the highest levels of assessment of a GLE and the other (lower) levels with potential for assessment items. The “target” assumes that only the highest level is assessed.

Related Glossary Terms

Drag related terms here

Understanding by Design

Is a set of ideas and practices that helps you think more purposefully and carefully about the nature of any design that has understanding as its goal. It is based on the work of Jay McTighe and Grant Wiggins and focuses on the principles of “Backwards Design”

Related Glossary Terms

Drag related terms here

Index

Unpacking Standards

Process of clearly defining the critical content and skills embedded in a standard that students need to know and be able to demonstrate to show mastery of the standard.

Related Glossary Terms

Drag related terms here

Index

Value-added models

Complex statistical procedures used in conjunction with growth data and are intended to quantify how much each teacher or school has contributed to a student’s growth in comparison to the average rate of growth.

Related Glossary Terms

Drag related terms here

Index